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ABSTRACT

This guide is intended to assist vocational educators teaching a course in graphics to relate the skills addressed in science courses to a particular vocational education course. The guide consists of a curriculum alignment chart that cross-references vocational performance indicators to science skills/competencies. The science competency indicators presented for each vocational education performance indicator are broken down according to science course and grade level. Selected teacher helps in the form of student exercises are provided for some of the performance indicators listed in the curriculum alignment chart, and student behavior checklists are provided for others. Reference materials are also listed where appropriate. (MN)

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CURRICULUM ALIGNMENT CHART

VOCATIONAL EDUCATION COURSE Graphics

VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 001 01. Listens to oral instructions. 02. Read instructions carefully. 03. Ask clarifying questions. 04. Complete tasks satisfactory.	001 Follow oral or written instruction for performing job tasks. SKILLS: Demonstrate Suggest Accept Express	ELEMENTARY SCIENCE/MANIPULATIVE SKILLS Grades K-12 1.01 Demonstrate the proper use of a laboratory instrument appropriate for the student's grade level or course 2.01 Demonstrate proper care of laboratory instruments when using and storing them ELEMENTARY SCIENCE Grades 4-6 1.01 Suggest ways of finding a solution(s) of a given science problem by using a scientific method EARTH SCIENCE/PROCESS SKILLS Grades 7-9 6.01 Make predictions based on collected data BIOLOGY/ATTITUDES Grades 7-12 4.01 Enjoy the challenge of formulating theories to explain observations 5.01 Make interpretations of observations and data obtained from experiments 6.02 Express empathy for the uncertainties associated with the so-called laws of science through discussion, debates, and experimentation

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001

Possible Points	Student Score PRE	Student Score POST
10		
10		
10		
70		
100		

STUDENT BEHAVIOR CHECKLIST

1. Listens when instructions are given orally.
2. Reads instructions carefully before starting.
3. Asks for clarification/explanation.
4. Completes tasks according to instructions.

CURRICULUM ALIGNMENT CHART

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 002 01. Follow instructions. 02. Use safety glasses, aprons, gloves when necessary. 03. Observe good hygiene practices.	002 Follow prescribed safety procedure in performing tasks. SKILLS: Demonstrate Discriminate	ELEMENTARY SCIENCE/MANIPULATIVE SKILLS Grades K-12 1.01 Demonstrate the proper use of a laboratory instrument appropriate for the student's grade level or course 2.01 Demonstrate proper care of laboratory instruments when using and storing them ELEMENTARY SCIENCE Grades 4-6 (Living Things) 6.01 Discriminate between good and bad health practices

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002

DIRECTIONS TO TEACHER: Insert here major safety procedures prescribed for students in your class, lab or shop. Assign "possible points" to each behavior.

Possible Points	Student Score PRE	Student Score POST
10		
10		
10		
10		
10		
10		
10		
10		
10		
10		
100		

STUDENT BEHAVIOR CHECKLIST

1. Uses good safety practices in operating equipment
2. Handles chemicals and solutions with care
3. Uses tools in a safe manner
4. Never distracts other persons at work
5. Works alone when operating equipment
6. Shows attention to good hygiene to avoid dermititis, viruses etc.
7. Keeps attention to good hygiene to avoid dermititis
8. Demonstrates good housekeeping habits
9. Shows concern for safety of classmates
10. Avoids horseplay

CURRICULUM ALIGNMENT CHART

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 006 01. Select appropriate tools, equipment, and materials. 02. Use tools, equipment, and materials appropriately. 03. Follow recommended procedures. 04. Conserve supplies and/or materials. 05. Return equipment, supplies, and materials to appropriate place. 06. Follow safety precautions. 07. Notify appropriate person in event of malfunction of equipment.	006 Handle materials, tools, and equipment in a responsible manner. SKILLS: Demonstrate Show Describe	ELEMENTARY SCIENCE/MANIPULATIVE SKILLS Grades K-12 1.01 Demonstrate the proper use of a laboratory instrument appropriate for the student's grade level or course 2.01 Demosntrate proper care of laboratory instruments when using and storing them PHYSICAL SCIENCE Grades 8-12 (Introduction to Physical Science) 4.02 Demonstrate an understanding of instrument sensitivity, parallax, and judgement errors which can result in inaccurate measurement when given a ruler and a measurement problem (Mechanics) 6.02 Demonstrate how simple machines do work PHYSICAL SCIENCE/ATTITUDES Grades 7-12 3.01 Show, by action and thought, the need for people to conserve, preserve, and make wise use of natural resources

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006

Possible Points	Student Score PRE	Student Score POST
15		
15		
15		
15		
15		
15		
10		
100		

STUDENT BEHAVIOR CHECKLIST

1. Selects appropriate tools, equipment and materials for task being performed.
2. Uses tools, equipment and materials in manner prescribed for performing task.
3. Follows recommended procedures in general maintenance of equipment.
4. Conserves supplies and/or materials.
5. Returns equipment, supplies and materials to appropriate place and/or position when not in use.
6. Follows safety precautions given for usage and storage of all tools, materials, and equipment.
7. Notifies appropriate person in event of malfunction of equipment.

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 008 01. Keep body and hair clean. 02. Dress appropriately. 03. Wash hands frequently when using chemicals, solutions, and inks.	008 Maintain appropriate personal hygiene and appearance. SKILLS: Discriminate Identify	ELEMENTARY SCIENCE Grades 4-6 (Living Things) 6.01 Discriminate between good and bad health practices BIOLOGY Grades 10-12 (Microbiology) 1.03 Identify from a list of familiar diseases those caused by viruses or bacteria

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008

Possible Points	Student Score PRE	Student Score POST

STUDENT BEHAVIOR CHECKLIST

1. Body and hair is clean and free of odor.
2. Dressed appropriately for occupation.
3. Grooming and appearance would be acceptable in a real work setting.

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS		
011 01. Understand the basic principle behind offset printing: oil and water will not mix. 02. Relate this principle to the offset process.	011 Summarize the historical development of the printing processes. SKILLS: Identify List Explain Describe	ELEMENTARY SCIENCE Grades 4-6 (Matter and Energy) 16.01 Distinguish between mixtures and compounds 16.02 Identify substances which are mixtures and compounds CHEMISTRY GRADES 10-12 (The Science of Chemistry) 3.01 Explain the concepts of density and specific gravity after performing a density experiment with various materials 3.02 Describe the physical properties of matter such as linear dimensions, volume, weight, mass, freezing point, boiling point, malleability, shape etc., through observation and experimentation

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011

A The basic principle of offset printing is:

A. Oil and water will not mix.
B. Oil and water mix very slightly.
C. Oil makes a good Ink vehicle.
D. Water protects the image area.

OUTLINE

I. History
   A. Early Developments
   B. The Alphabet
   C. Early printing
   D. Men, event, dates
      1. Wang Chieh
      2. Johann Gutenburg
      3. Stephen Daye
      4. Alois Senefelder
   E. Development of typestyles
      1. Roman
      2. Text
      3. Sans Serif
      4. Square Serif
      5. Script
      6. Decorative

CURRICULUM ALIGNMENT CHART

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 020 01. Understand the difference between hot and cold type composition. 02. Explain the basic principle of photo-typesetting. 03. Explain the use of photographic chemicals in phototypesetting. 04. Explain the use of light-sensitive paper (emulsion) in phototypesetting.	020 List the equipment, tools, and materials used in copy preparation. SKILLS: Identify List Describe Explain	PHYSICAL SCIENCE Grades 8-12 (The Atom) 4.01 Explain three ways radiation is detected (ionization, scintillation, and photography) (Inorganic Chemistry) 4.01 Identify compounds, mixtures, and elements when given a list including some of all 4.02 List two ways compounds differ from mixtures 7.01 List correct symbols and/or formulas when given names of common elements and compounds 7.02 Write simple chemical reactions using symbols and formulas

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020

Briefly explain the basic principal of phototype setting.

Use of developer and stabilizer and light-sensitive paper. Refer to darkroom chemistry.

OUTLINE

Composition Methods

A. Hot Type
   1. Hand set
   2. Ludlow
   3. Linecasting
   4. Hottype and offset

CURRICULUM ALIGNMENT CHART

VOCATIONAL EDUCATION COURSE Graphics

VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 026 01. Mix both stock and working solutions for processing materials in the darkroom. 02. Describe the function of solutions in the photographic processes. 03. Understand the principle of light reflection and transmission. 04. Understand the theory of light transmission and absorption. 05. Identify and handle chemicals in an appropriate manner. 06. Explain the reaction of film to both light and chemical solutions.	026 Set up the darkroom and make a line negative using the gray scale. SKILLS: Identify List Describe Explain Demonstrate Discover	PHYSICAL SCIENCE Grades 8-12 (The Atom) 4.01 Explain three ways radiation is detected (ionization, scintillation, and photography) (Inorganic Chemistry) 4.01 Identify compounds, mixtures, and elements when given a list including some of all 4.02 List two ways compounds differ from mixtures 7.01 List correct symbols and/or formulas when given names of common elements and compounds 7.02 Write simple chemical reactions using symbols and formulas CHEMISTRY Grades 10-12 (Acids, Bases, and Salts) 1.01 Identify ways each of a list of common acids, bases, and salts may be used either in the home or in industry 2.02 Identify the formulas of simple acids, bases, and salts, each by name PHYSICS Grades 10-12 (Optics and Waves) 2.02 Solve for unknown such as focal lengths and image distance using lens problems 4.01 Demonstrate the wave theory of light with respect to reflection, refraction, image formation, interference, diffraction, and resolution using lab activities and class exercises

026 IV.87 Continuous Tone Photography
(Objectives 9 and 10)
Assignment No. 4.15

Mixing Chemicals

In photography, it is necessary to maintain consistency at all points in the process. Throughout this assignment, you will be required to mix chemicals properly. If you have any questions, ask your instructor for help.

Directions: Read through this assignment completely. Pay special attention to the Learning Areas. Work safely around chemicals in the mixing area and in the darkroom. Whenever you spill chemicals or water, be sure to wipe them up immediately. Always wash your hands as soon as you are through handling photographic chemicals.

Learning Areas: At the completion of this assignment, you will be able to:

1. Control water temperature.
2. Measure correct volumes of water and chemicals.
3. Store chemicals in properly marked containers.

Tools and Materials:

1. Instruction sheet on mixing chemicals
2. Measuring graduates
3. Thermometer
4. Mixing paddle
5. Chemical storage bottles (plastic is best)
6. Trays

Procedure:

1. Ask for chemicals from your instructor.
2. Read through the directions for mixing completely before you start.
3. Adjust the water temperature to that called for in the manufacturer's mixing directions.
4. Measure the exact amount of water called for using the graduate and add it to your mixing container.
5. Slowly add powdered chemical, stirring constantly as directed in the mixing instructions.

IV.88

6. Don't forget to stir evenly and constantly until the chemical is fully dissolved.
7. Add a sufficient amount of water to make the total volume required by the specifications sheet.
8. This is a "stock solution". It is stored until needed. It is usually mixed with water before it is ready for use. Then it is known as a "working solution".
9. Now add stock solution to water to make the working solution.
10. Directions for mixing working solution read, "Mix 1:2 for working solution". This means mix one part stock solution to two parts water. The first number is the stock; the second is the water.
11. Mix the stop bath. BE SURE TO ALWAYS ADD THE CHEMICAL TO THE WATER never add the water to the chemical. Follow the directions of the product manufacturer.
12. Mix the fixer, using the same procedure outline in steps 1 through 8.

Self Evaluation:

1. List the steps involved in mixing chemicals.
2. Why is it important to add the chemical to the water?
3. Does it matter if you add the wrong amount of water to the stock solution when you make working solution? Why?
4. What does 1:2 mean?

References:

Muse, Ken. Photo One. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1973. pp. 82-93.

Brockhuisen, Richard J. Graphic Communications. Bloomington, Illinois, McKnight & McKnight Publishing Company, 1973. p. 277.

Brummitt, Wyatt. Photography Is. Garden City, New York, American Photographic Book Publishing Co. Inc., 1973. pp. 69-72.

Jordan, Franklin I. and Wall, E. J. Photographic Facts and Formulas. Englewood Cliffs, New Jersey, Prentice-Hall, Inc., 1976. p. 82.

OUTLINE

Line photography

A. Types of copy
B. The darkroom
C. Camera adjustments
D. Exposures
E. Handling film
F. The gray scale
G. Processing film
H. Problem copy
I. Line exposure calibration

.Contact printing
A. Area preparation
B. Exposures
C. Handling film
D. Tints
E. Quality control
F. Positives
G. Spreads & choking

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 027 01. Describe the characteristics of reproduction film. 02. Understand the effects of light on films. 03. Understand and explain the function of emulsion coating on light sensitive films. 04. Understand the effects of chemical solutions on films. 05. Explain the difference between orthochromatic and panchromatic film.	027 Describe the characteristics of reproduction films. SKILLS: Discover Demonstrate Show	**PHYSICAL SCIENCE** Grades 8-12 (Inorganic Chemistry) 3.01 Indicate elements which will displace other elements involved in a chemical reaction when given the electrochemical series **CHEMISTRY** Grades 10-12 (Matter--Composition and Changes) 4.01 Recognize and explain selected chemical changes that occur during selected reactions 4.02 Describe changes such as endothermic and exothermic reactions, kindling temperature, spontaneous burning, and conditions necessary for combustion/oxidation **PHYSICS** Grades 10-12 (Optics and Waves) 2.02 Solve for unknown such as focal lengths and image distance using lens problems 4.01 Demonstrate the wave theory of light with respect to reflection, refraction, image formation, interference, diffraction, and resolution using lab activities and class exercises

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027 INSTRUCTIONS TO THE STUDENT: Choose the best answer and mark it in the space provided.

B 1. To expose film means to

a. talk about it
b. reveal light to it
c. process the image
d. change the f/stop

D 2. When light passes through a negative image onto a sheet of photographic film, it will produce a

a. negative image
b. neutral image
c. no image
d. positive image

C 3. After being exposed, the film carries a _____ image.

a. Non-existant
b. unseen
c. latent
d. clear

A 4. Film in photography acts as

a. a vehicle to carry the image
b. a vehicle which arries light
c. a black and white picture
d. a color picture

C 5. The light sensitive coating on the film is called

a. plastic
b. imaging
c. emulsion
d. halftone

INSTRUCTIONS TO STUDENT: In the space provided mark a T if the statement is True or an F if the statement is False.

T 1. Orthochromatic and panchromatic films are the two most common kinds of film used for process photography.

F 2. Panchromatic film may be used only if red safe lights are on in the dark room.

T 3. Orthochromatic film is not sensitive to red light.

T 4. Orthochromatic film is used more often in making line and halftone negatives.

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 029 01. Know the location of films, papers, and chemicals in the darkroom. 02. Handle films, papers, and chemicals in an appropriate manner. 03. Read instructions. 04. Read labels on films, chemicals before using. 05. Describe the dangers and hazards which may be encountered when using and handling solutions. 06. Observe good hygiene practices. 07. Does not participate in "horseplay" in the darkroom.	029 Prepare a list of darkroom safety procedures. SKILLS: Demonstrate Show Describe	ELEMENTARY SCIENCE/MANIPULATIVE SKILLS Grades K-12 1.01 Demonstrate the proper use of a laboratory instrument appropriate for the student's grade level or course 2.01 Demonstrate proper care of laboratory instruments when using and storing them PHYSICAL SCIENCE Grades 8-12 (Introduction to Physical Science) 4.02 Demonstrate an understanding of instrument sensitivity, parallax, and judgement errors which can result in inaccurate measurement when given a ruler and a measurement problem PHYSICAL SCIENCE/ATTITUDES Grades 7-12 3.01 Show, by action and thought, the need for people to conserve, preserve, and make wise use of natural resources

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029

INSTRUCTIONS TO STUDENT: In the space provided, mark a T if the statement is True or an F if the statement is False.

T 1. New classes should be taken on a safety tour as one of the first items of business.

T 2. It is important for each student to know each location which might present the possibility of injury.

F 3. "Horseplay" is permitted in the dark rooms as there is no equipment with moving parts being used.

F 4. Since there are directions on most chemical containers, the student need not get instructions or permission from the instructor prior to using the chemicals.

T 5. Each student should be thoroughly instructed in the dangers and hazards which may be encountered when using a particular solution prior to being allowed to use that solution.

F 6. A quick rinse in cold water will be sufficient to clean your hands after using most chemicals.

F 7. Chemicals should be stored on the top shelves where they will be well out of the way.

T 8. A good practice when mixing solutions is to wear safety glasses.

T 9. Never use food or drink container for storing chemicals as accidental poisoning may occur.

T 10. Rubber aprons should be worn to keep spilled chemicals away from your clothes.

T 11. When mixing solutions you should always pour the chemical into the water, not the water into the chemical.

T 12. When handling graduates or jars it is a good practice to keep the little finger extended under the bottom to prevent its slipping from your hand.

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 033 01. Explain the difference between flat color and process color. 02. Understand that color is a visual sensation. 03. Explain the principle of light reflection and absorption in color reproduction. 04. Explain the color wheel (primary, secondary colors).	033 Produce an accurately registered flat for a multicolored line job. SKILLS: Discover Demonstrate Show Describe	**ELEMENTARY SCIENCE** Grades 4-6 (Matter and Energy) 26.01 Describe light as that aspect of radiant energy which permits one to see 26.02 Demonstrate how white light is broken into the various colors utilizing a prism **PHYSICAL SCIENCE** Grades 8-12 (Inorganic Chemistry) 3.01 Indicate elements which will displace other elements involved in a chemical reaction when given the electrochemical series **CHEMISTRY** Grades 10-12 (Matter--Composition and Changes) 4.01 Recognize and explain selected chemical changes that occur during selected reactions 4.02 Describe changes such as endothermic and exothermic reactions, kindling temperature, spontaneous burning, and conditions necessary for combustion/oxidation **PHYSICS** Grades 10-12 (Optics and Waves) 2.02 Solve for unknows such as focal lengths and image distance using lens problems 4.01 Demonstrate the wave theory of light with respect to reflection, refraction, image formation, interference, diffraction, and resolution using lab activities and class exercises

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033-

INSTRUCTIONS TO STUDENT: To the left of each statement, write T for True or F for False.

T 1. Two main classes of color printing are flat color and process color.

T 2. Process color printing reproduces an illustration in full hues.

T 3. Color is a visual sensation.

T 4. Additive light primaries are red, yellow, and blue.

F 5. The word hue describes the intensity of a color.

F 6. The value of a color cannot be changed.

T 7. Color has a temperature.

T 8. Printing inks are subtractive in nature.

F 9. Red ink on white paper appears red because the pigment absorbs red light and turns the ink red.

T 10. Adding the light primaries red and green produces yellow.

T 11. The subtractive primaries are magenta, cyan, and yellow.

T 12. Ink can be either transparent or opaque.

T 13. Copy for color reproduction may be either reflection or transparent copy.

F 14. Two basic procedures for making color separations are direct and process color.

F 15. Each color requires a separate flat when printing flat color.

F 16. Black and white photographic illustrations printed in two colors are called key lines.

T 17. A tint screen can be used to give color to an image, illustration or background.

T 18. Overprinting a tint is a common method of producing flat color.

T 19. Adjacent colors that meet should overlap slightly.

F 20. Mechanical film (rubylith) is a material commonly used in process color separation.

T 21. "Hand drawn process color" is another term for "fake" color.

T 22. Process color photography requires the use of panchromatic films.

F 23. Process color halftones are made with the magenta contact screen.

T 24. Process color separation photography requires the use of red, green, and blue filters.

F 25. The red filter produces the yellow printer.

T 26. Color-key is a typical color proofing material.

F 27. The purpose of the black ink over printer on four-color process is to cover the light areas.

T 28. Direct process color separation is the simplier of the separation techniques.

T 29. Each process color halftone negative must be produced at a specific angle to prevent moire patterns.

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS		
036 01. Describe the difference between silverprint, brownline, electrostatic, dylux, blueprint, and diazo. 02. Describe the use of chemical solutions in producing the above.	036 Proof a flat. SKILLS: Demonstrate Identify	PHYSICAL SCIENCE Grades 8-12 (Electricity and Magnetism) 1.01 Identify the interaction of two oppositely charged objects with respect to attraction or repulsion 1.02 Identify conductors and insulators (nonconductors) when given a list of common objects 3.01 Demonstrate that a wire carrying an electric current produces a magnetic field when given wire, battery, and a compass 8.02 Demonstrate which solutions will conduct electricity when given solutions of electrolytes and nonelectrolytes and a conducting apparatus

036.

INSTRUCTIONS TO STUDENTS: Match the phrase in column A with the word in Column B.

COLUMN A	COLUMN B
B 1. Organic iron compounds	A. Electro-static
A 2. Electron transfer	B. Blueprint
C 3. Silver salts	C. Brownline
E 4. Colored Diazo	D. Dylux
G 5. Diazo	E. 3M Color Key
	F. Whiteline
	G. Blueline

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS		
038 01. Describe the differences between paper, metal, and bi-metal offset plates. 02. Identify materials and processes used in the preparation of offset plates. 03. Describe the function of light in the preparation of offset plates. 04. Describe the function of materials and solutions in the preparation of off-set plates.	038 Identify the materials and processes of the platemaker. SKILLS: Identify Give examples Describe	ELEMENTARY SCIENCE Grades 4-6 (Matter and Energy) 25.01 Identify properties of wave energy such as reflection and refraction 26.01 Describe light as that aspect of radiant energy which permits one to see PHYSICAL SCIENCE Grades 8-12 (The Atom) 1.01 Describe properties of each state of matter and indicate how they are interrelated (Inorganic Chemistry) 4.01 Identify compounds, mixtures, and elements when given a list including some of all 11.01 List the characteristics of a solutions and a nonsolution

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038

INSTRUCTIONS TO STUDENTS: Select the correct word or words that complete the statement.

1. An offset plate made up of more than one type metal is called a Bi-Metal plate.
2. A thin layer of metal on a fiber base refers to Paper plates.
3. The main type of offset plate used in industry is the Metal plate.

INSTRUCTIONS TO STUDENTS: Match the item in Column A with the description in Column B.

COLUMN A		COLUMN B
E 1.	Developing lacquer	A. A light sensitive coating which is a mixture of egg and ammonium bichromate.
C 2.	Arc lamp	B. Modern pre-sensitized short run plates.
J 3.	Desensitizer	C. Device for exposing plate.
N 4.	Cotton pad	D. A plate which can be typed, written, or drawn on.
B 5.	Paper plate	E. Used to strengthen the image.
H 6.	Ammonium bichromate	F. Roughening plate surface.
A 7.	Albumin	G. The image area is slightly below the non-image area.
O 8.	Electro-static	H. The most common sensitizer.
D 9.	Direct image plate	I. Exposed with a positive flat.
G 10.	Deep etch plate	J. Use to remove unexposed or unhardened sensitive chemical on a plate.
F 11.	Graining	K. Exposed with a negative flat.
M 12.	Etching on press	L. Gum arabic 6°-8° baume.
L 13.	Gumming a plate for storage	M. Used to process a plate.
K 14.	Negative plates	N. When plate not in use for short time.
I 15.	Positive plates	O. Used for modern rapid reproduction operations.

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS		
040 01. Measure pH. 02. Describe the basic composition of lithographic inks (pigment, vehicle).	040 Identify the parts of an offset press. SKILLS: List characteristics Identify Determine	PHYSICAL SCIENCE Grades 8-12 (Inorganic Chemistry) 8.01 List basic characterisitcs of acids, bases, and salts, and give examples of each group CHEMISTRY Grades 10-12 (Acids, Bases, and Salts) 1.01 Give reasons for and/or explain the arrangement of the elements in the periodic table 2.02 Identify the formulas of simple acids, bases, and salts, each by name 3.01 Determine experimentally the pH, the effect on litmus paper, and other physical characteristics of acids, bases, and salts

040 pH—What It Is and How To Measure It

When we studied acids, you learned that the total acidity of a solution is composed partly of "immediate acidity" and partly of "reserve acidity." A strong acid has a high immediate acidity and a very low reserve acidity. A weak acid differs from a strong acid in having a high reserve acidity and a lower immediate acidity. At that time it was mentioned that the "pH" of a solution is a measure of the immediate acidity of that solution. It is time now to elaborate on this statement, so you can understand pH better.

Relation Between pH and Hydrogen Ion Concentration. The measurement of pH is connected with the hydrogen ions which are present in a solution. We speak of the hydrogen ion *concentration* of the solution. The atomic weight of hydrogen is close to 1.0, so 1.0 gram of hydrogen ions is a "mole" of hydrogen ions. This weight, or any other weight, of hydrogen ions could be present either in a small amount of water or a large amount of water. By *concentration*, we mean not only the amount of hydrogen ions but the volume of water in which they are dissolved. For pH measurements, the concentration of H^+ ions is measured in *grams of H^+ per liter of solution*.

The equation which shows the relation between the pH of a solution and the hydrogen ion concentration of that solution is as follows:

$$pH = -\log (H^+) \qquad (1)$$

where (H^+) is the concentration of hydrogen ions, measured in grams of H^+ per liter of solution.

Things are beginning to look pretty tough, aren't they? But don't despair; one can use pH measurements in a lithographic plant, and obtain all the benefits which result from a control of the pH of various solutions, and know nothing about equation (1).

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS 042 01. Match corrective measures to related press, paper, and ink problems. 02. Mix press fountain solution to specifications. 03. Mix and match ink to proper applications.	042 Set up the press and run a multicolored job. SKILLS: Demonstrate Make solutions Distinguish	**ELEMENTARY SCIENCE/MANIPULATIVE SKILLS** Grades K-12 1.01 Demonstrate the proper use of a laboratory instrument appropriate for the student's grade level or course 2.01 Demonstrate proper care of laboratory instruments when using and storing them **ELEMENTARY SCIENCE** Grades 4-6 (Matter and Energy) 5.01 Make and describe a solution from given ingredients (i.e., salt and water) 16.01 Distinguish between mixtures and compounds **PHYSICAL SCIENCE** Grades 8-12 (Inorganic Chemistry) 4.01 Identify compounds, mixtures, and elements when given a list including some of all

VII.29

042

Plates and Press
Lesson Plan

Mixing Lithographic Fountain Solution to the Correct pH

Objective 7: Upon completion of this unit, each student will mix lithographic fountain solution according to specifications and test the pH within _____ time limit to accuracy determined by the instructor.

Tools and Equipment

1. Fountain solution bottle or container
2. Chemical mixing graduate

Instructional Materials

1. Assignment sheet -- "Mixing Lithographic Fountain Solution to the Correct pH", No. 7.17
2. Chemicals for mixing fountain solution
3. pH indicator strips, color comparators, or pH meter

The correct pH is extremely important in the lithographic process. In the interest of achieving proper pH, the following should be part of this lesson:

A. A high pH in the fountain solution, such as 7 or 8 causes the non-image areas of the plate to become ink receptive.
B. Low pH in the fountain solution, such as 3 or 4, causes blinding or slow rollup of the image areas on the plate.
C. How pH effects running paper. The lower the pH of the fountain solution the longer it takes for the ink to dry.

If you choose to give a demonstration on the subject, you may want to discuss pH in relation to the pH scale and the ways to measure pH. After the lesson, issue assignment no. 7.17, "Mixing Lithographic Fountain Solution to the Correct pH".

References:

Adams, J. Michael, and Faux, David D. Printing Technology. North Scituate, Massachusetts, Duxbury Press, 1977. pp. 307-309, 317.

Bentley, Olson, Strandberg, Wiper. Graphic Communications Series: Image Transfer. Chicago, Illinois, A. B. Dick Company, 1976. p. 7.

Cogoli, John E. Photo-Offset Fundamentals. Bloomington, Illinois, McKnight & McKnight Publishing Company, 1973. pp. 296, 327-328.

Lasday, Stanley B., ed. Handbook for Graphic Communications: Lithography. Pittsburgh, Pennsylvania, The Graphic Arts Technical Foundation, Inc., 1972. pp. 29-35.

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VOCATIONAL EDUCATION PERFORMANCE INDICATOR	VOCATIONAL EDUCATIONAL COMPETENCY SCIENCE SKILL/CONCEPT	RELEVANT SCIENCE COMPETENCY INDICATORS
INDICATORS		
047 01. Describe characteristics of paper.	047 Identify major types of paper. SKILLS: Identify Classify Give characteristics Describe Distinguish	ELEMENTARY SCIENCE Grades 4-6 (Matter and Energy) 2.01 Give characteristics of different kinds of matter such as wood, glass, metal, and cloth after a laboratory exercise dealing with a variety of materials 3.01 Describe properties such as color, shape, weight, and texture of given objects 15.01 Distinguish between chemical and physical changes such as the melting of ice and burning of a match PHYSICAL SCIENCE/PROCESS SKILLS Grades 7-9 1.01 Identify the similarities and/or differences, using the senses, when given a collection of objects or concepts 2.01 Classify a group of objects or concepts according to their various properties

VOCATIONAL EDUCATION COURSE Graphics

047

INSTRUCTIONS TO STUDENT: In the space provided, mark a T if the statement is True or an F if the statement if False.

T 1. High quality bond paper usually has a rag content ranging from 25% to 100%, depending on the grade.

T 2. Some of the requirements of bond paper are: permanence, ink receptive surface, good erasing qualities and freedom from lint.

T 3. Mimeograph paper is similar to bond but has a rougher finish.

T 1. Ledger paper is similar to bond, but is generally smoother, has a harder surface and is heavier.

T 2. Offset papers are the same as book papers, but specially formulated to meet offset requirements.

F 3. Newsprint is the highest grade of paper used for quality printing.

T 1. Booklets, menus and self-mailers are common uses for text papers.

T. 2. Text papers come in many decorative colors with a variety of finishes and often will have a deckle edge.

F 3. Since text papers are rarely printed on both sides, opacity would not be a requirement.